August 11, 2006

Mr. R. T. Ridenoure
Vice President - Chief Nuclear Officer
Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
Post Office Box 550
Fort Calhoun, NE 68023-0550

SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 - GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS," EXTENSION REQUEST APPROVAL (TAC NO. MD2323)

Dear Mr. Ridenoure:

Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," requested that all licensees complete actions related to the GL by December 31, 2007. By letter dated November 18, 2005, Omaha Public Power District (OPPD, the licensee) requested an extension to the completion date for the corrective actions to be taken at the Fort Calhoun Station, Unit 1 (FCS). OPPD requested an extension until the spring 2008 refueling outage. In an April 10, 2006, letter to OPPD, the U.S. Nuclear Regulatory Commission (NRC) denied the OPPD request noting that "OPPD did not commit to any new, focused interim compensatory measures to mitigate post-LOCA [loss-of-coolant accident] sump pool calcium phosphate levels (e.g., removal or sequestration of either the trisodium phosphate (TSP) pH buffer or the large amount of calcium silicate insulation remaining after the fall 2006 outage); nor did OPPD commit to installing a temporary strainer larger than the existing one."

By letter dated June 6, 2006, OPPD submitted a revised request for an extension of the completion date for the FCS corrective actions to be taken in response to GL 2004-02. OPPD stated that it has continued to actively pursue resolution of Generic Safety Issue (GSI)-191 relating to emergency core cooling system (ECCS) and containment spray system (CSS) sump clogging. For example, OPPD noted it has identified a candidate pH buffer material that could mitigate the chemical effects from the combination of TSP and calcium silicate insulation as identified in Information Notice 2005-26 and Information Notice 2005-26, Supplement 1. However, OPPD stated that full resolution of issues associated with chemical and downstream effects, which may affect the size of the permanent replacement strainers, remained incomplete.

OPPD has conducted testing of (candidate) sump strainer configurations using FCS-specific debris loadings. As a result of a number of unresolved issues associated with this testing, some of the testing will have to be repeated. This testing will not be completed in time to support design and installation of the permanent replacement sump strainers during the fall 2006 refueling outage (the only outage remaining until the December 31, 2007, GL 2004-02 compliance date). As such, OPPD in its June 6, 2006, letter revised its GL 2004-02 item 2(b)

supplemental response (documented in a letter dated August 31, 2005) by requesting an extension for the completion of the permanent sump strainer hardware modifications until the FCS spring 2008 refueling outage scheduled to begin by May 1, 2008.

As part of this request, OPPD has committed to complete the following mitigative measures during the FCS fall 2006 refueling outage:

- Replace the TSP with an alternate pH buffer which reduces the risk for sump screen blockage caused by formation of chemical precipitates (this will require a separate license amendment request (LAR));

- Install two interim strainer modules (one per train) with approximately 1,100 square feet of total surface area;

- Remove the automatic start feature for one containment spray (CS) pump (this LAR is currently under review);

- Install debris exclusion devices on reactor cavity and refueling cavity drain lines;

- Install reactor vessel spacer rings to reduce water hold-up in the upper cavity;

- Replace approximately 823 cubic feet of calcium silicate insulation in conjunction with the replacement of the existing steam generators, pressurizer and reactor vessel head. OPPD stated that this represents the removal of approximately 62 percent of the calcium silicate insulation inside the biological shield wall that may fall within the zones of influence of a LOCA. The replacement material will be reflective metal insulation (RMI) where dimensions are known in advance, and low density fiberglass (Thermalwrap) would be used elsewhere;

- Replace the calcium silicate insulation with low density fiberglass (Thermalwrap) on the pressurizer spray line to eliminate generation of calcium silicate debris from the small break loss-of-coolant accident that presents the greatest risk of debris generation and transport; and

- Remove approximately 7,041 square feet (35%) of unqualified coatings.

OPPD stated that the following mitigative measures are already in place, and the new latent debris monitoring enhancement will be completed by the end of the 2006 FCS refueling outage:

- Operator procedural guidance and training for core cooling and containment integrity as discussed in OPPD's NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-[W]ater Reactors" responses dated August 8, 2003, and June 11, 2004, including:

    - Various combinations of high pressure safety injection (HPSI) pump and containment spray (CS) pump shutdowns and throttling to allow for maximum debris settling and minimize pump cavitation (relying ultimately on containment

air coolers for atmospheric control and heat removal, while maintaining core cooling and coverage with one HPSI pump), and

- Refill of the safety injection refueling water storage tank (SIRWT) with borated and demineralized water so that [the] safety injection can be continued if suction via the containment sump strainers is lost, until the containment is filled to the top of the reactor coolant system (RCS) hot legs while maintaining reactivity control (equipment is aligned for shutdown cooling prior to submergence). Core cooling would be provided by HPSI pump flow and the water outside of the reactor vessel.

- NRC approval of the leak-before-break principle at FCS;

- Containment cleanliness actions (housekeeping and foreign material exclusion [FME] programs) as documented in Bulletin 2003-01. For example:

  - Revised surveillance procedures to provide specific guidance for inspection of containment sump screens to ensure no adverse gaps or breaches, with Quality Control verification, and

  - New latent debris collection procedure validated during the 2005 FCS refueling outage (20 samples throughout [the] containment leading to a calculated total latent debris load for comparison with values used in the FCS debris generation and transport analysis - OPPD stated that this procedure will be fully implemented prior to the completion of the FCS fall 2006 refueling outage).

In addition to its extension request, OPPD outlined its plan to address outstanding technical issues relative to the resolution of GSI-191 as follows:

- Replace the TSP pH buffer with an alternate buffer which will largely eliminate post-LOCA sump pool chemical effects from calcium phosphate production;

- A significant reduction of the screen approach velocity during recirculation will be achieved by the fall 2006 refueling outage through interim strainer module installation, removal of auto-start of one CS pump, and implementation of procedural guidance and training to secure and throttle ECCS and CSS pumps. With the interim strainer modules in place, approach velocities would be on the order of 0.01 ft/sec to 0.02 ft/sec, so that only small fines of suspended fibrous insulation and particulates would be transported to the sump strainers. OPPD stated that based on information provided in NUREG/CR-6808, “Knowledge Base for the Effects of Debris on [Pressurized-Water Reactor] PWR Emergency Core Cooling Sump Performance, February 2003,” a significant fraction of this suspended material would settle to the floor of the containment before reaching the strainer; and

- Head loss testing has shown adequate net-positive suction head (NPSH) margin for the CS pumps and HPSI pumps with a replacement 1,500 square foot strainer (one train), and that scaling that test data to the 1,100 square feet of available interim strainer surface (both trains) also resulted in adequate NPSH margin for these pumps.

The NRC has concluded that OPPD has a plan in place that will result in the installation of final GSI-191 modifications that will provide acceptable strainer function with an adequate margin for uncertainties. Further, OPPD has addressed the comments from our April 10, 2006, letter by taking compensatory mitigative measures to adequately reduce risk for the requested short extension period. Therefore, the NRC has concluded that the request to extend the completion date for the FCS permanent sump strainer hardware modifications for compliance with Generic Letter 2004-02 until the completion of the FCS spring 2008 refueling outage, scheduled to begin by May 1, 2008, is acceptable. Should OPPD elect to begin the outage more than 30 days after May 1, 2008, OPPD will need to provide the NRC additional justification for further delay in completing corrective actions for GL 2004-02.

If you have any questions or comments regarding this approval, please contact Alan Wang at (301) 415-1445.

Sincerely,

/RA/

Catherine Haney, Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-285

cc: See next page

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Catherine Haney, Director
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